

used on LE 1-1640

models 682 and 683 digital comparator



instruction manual
mi-1144A

MP MASTER



MA26228

DIGITEC

instrumentation

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After unpacking, carefully examine the instrument for physical damage that may have occurred in transit. If any damage is noted, immediately contact United Systems Corporation for further instructions.

If it should become necessary to return the instrument to United Systems Corporation, make certain that at least four inches of padding material surrounds the instrument to prevent damage during shipment. When returning instruments to the factory, give a full description of the failure of the instrument and the mode of operation that was used when the instrument failure occurred. Ship via REA Express, motor truck, or air freight PREPAID to:

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DIGITAL COMPARATOR

INSTRUCTION MANUAL MI-1144A

FOR MODELS 682, 683

1. GENERAL INFORMATION

1.1 Instrument Identification

The Model, Serial Number and other pertinent data are given on the identification tag on the right side of the case.

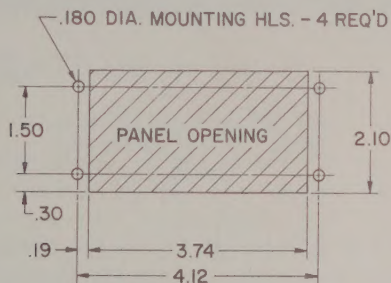
1.2 Technical Characteristics

Input	3 digits plus overrange and polarity
Input Code	Ascending 1-2-4-8 BCD
Input Level	
1	+2.2V to +12.0V
0	+0.5V to -2.0V
Input Impedance	39K per bit
Relay Contacts	SPDT, 5 amp, 115VAC, Resistive
Limit Latching	Provisions available for latching relay contacts
Connectors	2 each Cinch No. 251-12-36-160 (furnished)
Power Requirements	5VA, 105/125VAC, 50/60Hz ("S" Option — 210/250VAC)
Net Weight	1-1/2 pounds
Shipping Weight	3 pounds
Size	2.06"H x 4.50"W x 7.88"D

2. OPERATION

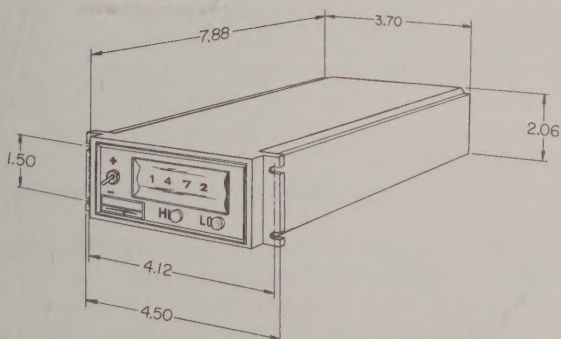
2.1 Installation

This comparator is designed to be permanently mounted into a panel using No. 6 Screws or studs. For proper mounting, the unit must be inserted into the cutout from the rear. Figure 1 illustrates the instrument opening and mounting dimensions, while Figure 2 illustrates the overall dimensions.



Panel Template

Figure 1

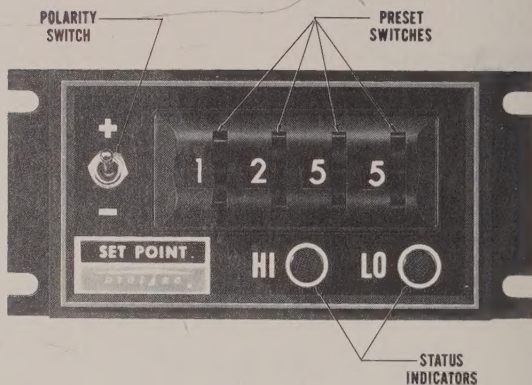


Outline Drawing

Figure 2

2.2 Preset Adjustments

The Model 682 Digital Comparator is designed to compare the ascending BCD from a DigiTec Series 270 Digital Panel Meter or a Model 281 Analog to BCD Converter. The preset number can be of any value from 0000 to ± 1999 as selected with the front panel switches (see Figure 3).



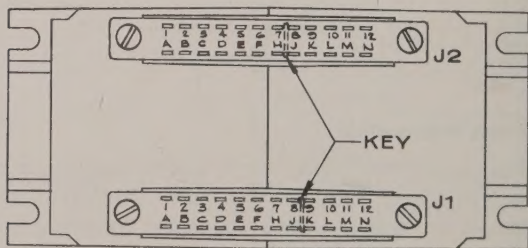
Front View of Instrument
Figure 3

When the polarity switch is in the plus position, any positive input number that is equal to or greater than the preset number will be indicated by the "HI" status indicator. An input number below the preset number will be indicated by the "LO" status lamp.

When the polarity switch is in the minus position, any negative number that is equal to or less than (less than, being less negative or more positive) the preset number will be indicated as "HI" on the status indicator. The "LO" indicator will indicate if the negative input number is greater than the preset number.

WHEN USING THE COMPARATOR WITH THE SERIES 270 OR 280, THE POLARITY SWITCH MUST BE IN THE PLUS POSITION.

A contact closure, coincident with the status of either indicator is provided at Connector J2 (see Figure 4).



Rear View of Instrument
Figure 4

2.3 Latching Mode

In some applications, it may be desirable to retain an indication that a preset limit has been momentarily exceeded. This is accomplished by allowing the status relay to latch in either the "HI" or "LO" position when the limit is exceeded.

Latch Position	Connector, J ₂
HI	Connect a normally closed switch between Pins 1 and 2.
LO	Connect a normally closed switch between Pins 3 and 4.

Depressing the switch will release the latch.

2.4 Remove Programming Input, Model 683

The preset number of this comparator may be remotely programmed by applying BCD information of the desired number to the Rear Connector, J₂ (see Section 4.2). The +3.6 volts needed to operate the remote programming can be obtained at Pin 1 of J₂. When using remote programming, all preset switches on the front of the unit must be set to zero.

2.5 210/250 Volt Operation

The 682 Comparator may be factory wired for 210/250VAC operation ('S' Option) by rearranging the primary transformer leads. The input power connections remain the same as the standard 105/125 volt units.

3. CIRCUIT DESCRIPTION (see Figure 7)

The logic in this comparator is designed to operate only with ascending 1-2-4-8 BCD. This type of BCD is constantly changing, therefore, coincidence between the BCD logic and the preset number occurs for only a matter of microseconds. To utilize this short coincidence time, a latching circuit which constantly checks for coincidence must be used.

3.1 Comparator

The comparator section consists of transistors Q1 through Q16 which are activated by the thumbwheel preset switches on the front panel.

Assume the preset switches are set to 1111. This will apply +3.6 volts to the Transistors Q2, 6, 10 and 19. If the BCD input number is 1111, then the transistors will conduct, lowering Point

'A' to zero. If any one of the digits was not equal to the preset number, such as in the number 1110, then the output at Point 'A' would be high.

The error transistor is connected so that the error bit, indicating overrange or incorrect polarity, prevents Point 'A' from going to zero.

The negative input section consists of the emitter follower, Q15, which drives Point 'A' directly when the polarity switch is in the plus position and through an inverter, Q16, when the polarity switch is in the minus position, thus a 'neg' bit will cause Point 'A' to be high when the polarity switch is in the plus position, indicating noncoincidence, and zero when the polarity switch is minus, indicating coincidence.

3.2 Detector

When coincidence occurs, Point 'A' goes to zero and transistor Q19 turns 'off', turning Q20 'on', thus producing a negative going pulse at the base of Q23. When Q23 is pulsed, it turns off, turning Q24 off, thus removing the drive to Q23 and latching the two transistors. Since the collector of Q23 is high, Q27 is turned 'on' and Q28 is turned 'off'. When the polarity switch is in the plus position, the relay, K1, is energized, but if the switch is in the minus position, the relay drops out, since Q28 inverts the operation of the relay.

If only one coincidence pulse is received, indicating momentary coincidence, Capacitor C6 begins to charge through R50. The Capacitor continues to charge until Q25 'fires', saturating Q26, reducing the bias on Q24, and unlatching Q23 and 24.

3.3 Reset

If subsequent pulses are received, indicating continuous coincidence, a reset of C6 must occur. When Q19 is turned off, D21 conducts turning Q21 and 22 'on', in addition to turning Q20 'off'. When Q22 is on, a discharge path exists from C6 through R52 to ground, thus preventing Q25 from firing. When coincidence fails to occur, C6 charges and releases the Q23/24 latch.

3.4 HI and LO Latches

This comparator has facilities for latching in either the 'HI' or 'LO' position.

HI Position

In the above latch mode, Pins 1 and 2 of J₂ are jumpered together. This causes Q29 to turn 'on' when relay K1 is energized.

Since the collector of Q29 is tied to the base of Q30 and the collector of Q30 is tied to the base of Q27, they both latch. Q30 then holds the relay K1 in the energized state even though the normal path through Q27 has been removed.

LO Position

In the below latch mode, Pins 3 and 4 of J₂ are jumpered together. When relay K1 is released, Pin 3 is made positive, and drives the base of Q31 through the below latch jumper. Q31 then conducts and lowers the collector voltage of Q23, thus preventing Q23 and 24 from latching and energizing the relay.

4. REAR CONNECTOR

The Model 682 Digital Comparator contains two printed circuit board connectors. The first connector, J₁, is used for BCD and power input and the second connector, J₂, is used for latching, contact closures, and remote programming (see Figure 4).

4.1 J₁, Input

BCD	Pin	BCD	Pin
1	.5	Error	M
2	.6	Negative	12
4	F	Power Line High	A
8	E	Power Line Low	B
10	H	Earth Ground	C
20	J	Common	11
40	.8	Not connected	.1, 2, 3, 4, D
80	.7		
100	.K		
200	10		
400	.L		
800	.9		
1000	.N		

4.2 J₂, Output

Function	Pin	Function	Pin
+12 volts	1	Relay common	5
Above latch	2	Relay normally open	6
Below latch	3	Relay normally closed	7
Below latch	4	+3.6 volts	8
		Not connected	9, 10, 11

J₂ Output (Cont.)

Model 683 Only, Remote Programming Input

BCD	Pin	BCD	Pin
1	A	100	K
2	B	200	L
4	C	400	M
8	D	800	N
10	E	1000	12
20	F		
40	H		
80	J		

5. MAINTENANCE

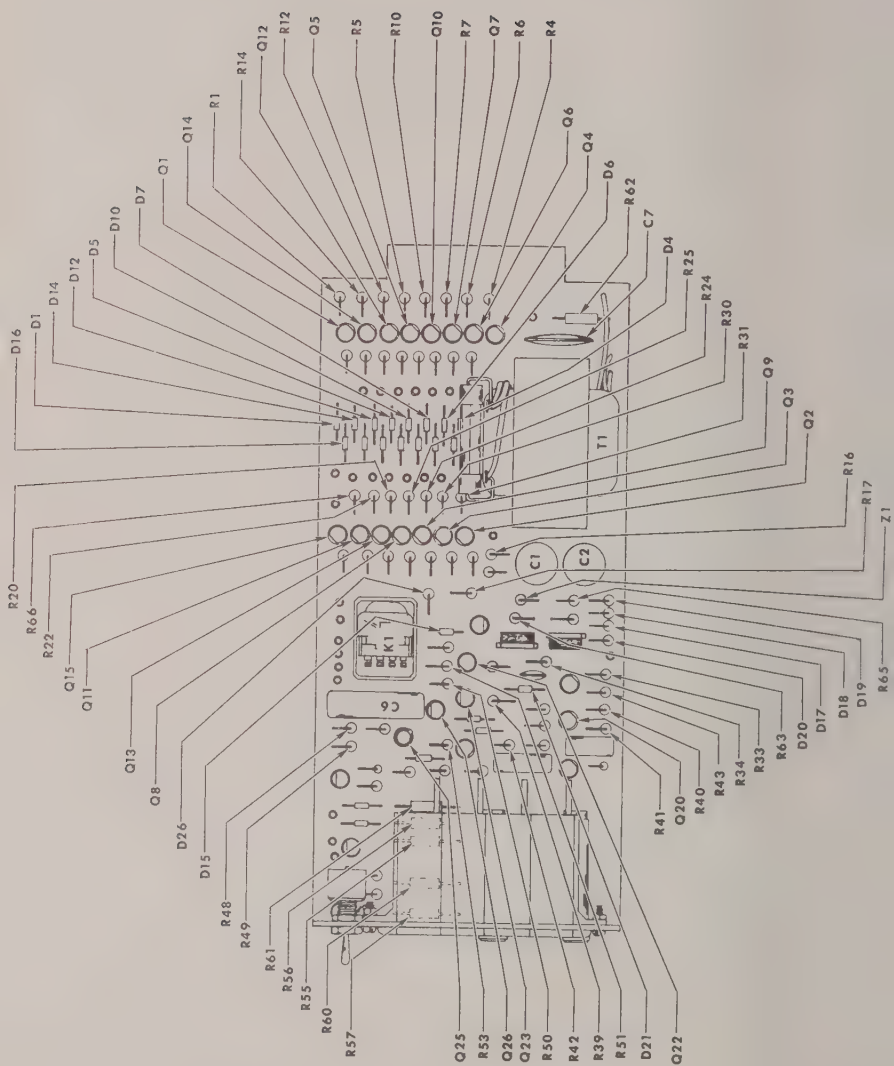
5.1 Troubleshooting Hints

<i>Symptom</i>	<i>Possible Cause</i>
High limit always on	Above latch circuit or relay driver, Q27
Low limit always on	+12 volt supply. +3.6 volt supply. Below latch circuit relay driver, Q28. Reset circuit.
Incorrect comparison between BCD input and preset number	Loose connection in wiring harness. Comparator section, reset circuit.

5.2 Fuse Replacement

This comparator contains a 1/4 amp fuse, (1/8 amp for 'S' suffix) which may fail as a result of severe line transients or from component failure within the instrument. If the replacement fuse fails, the circuit should be checked thoroughly. A HIGHER CURRENT FUSE SHOULD NEVER BE SUBSTITUTED. The fuse is mounted on terminals on the transformer.

**Pictorial Drawing
View 1
Figure 5**

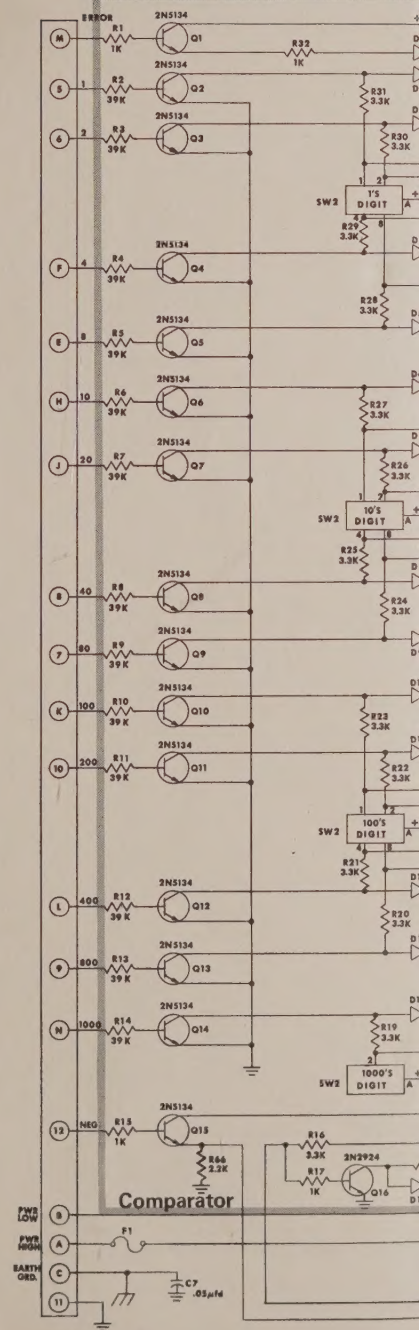


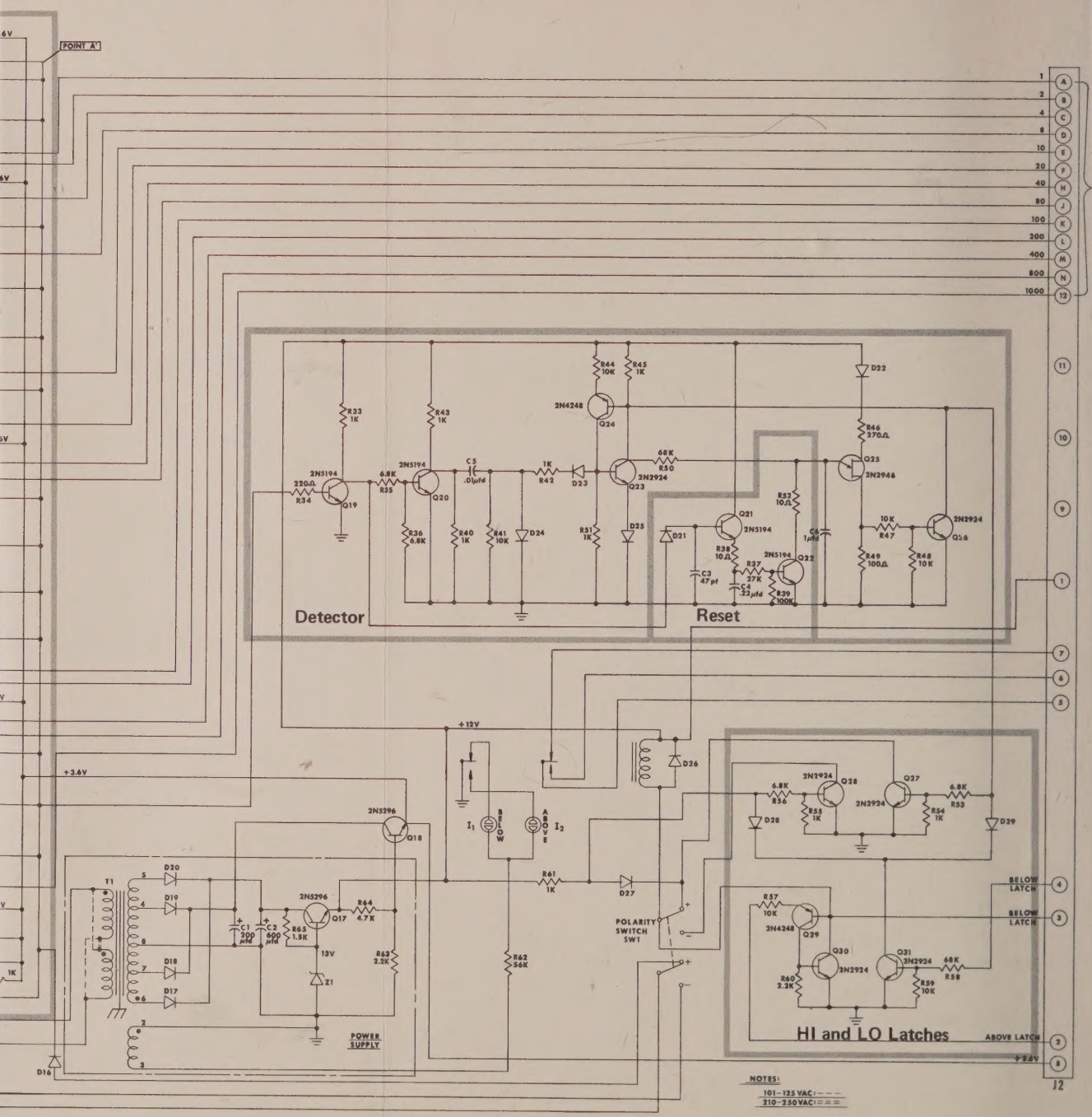
Pictorial Drawing
View 2
Figure 5

PARTS LIST

SYMBOL	DESCRIPTION	STOCK NUMBER
R1, 15, 17, 18, 32, 33, 40, 42, 43, 45, 51, 54, 55, 61	Resistor, Carbon, 1K, 1/2W, 10%	55-10102JK001
R2-14	Resistor, Carbon, 39K, 1/2W, 10%	55-10102JK039
R16, 60, 63, 66	Resistor, Carbon, 2.2K, 1/2W, 10%	55-10102JK002R2
R19-31	Resistor, Carbon, 3.3K, 1/2W, 10%	55-10102JK003R3
R34	Resistor, Carbon, 220 ohm, 1/2W, 10%	55-10102JA220
R35, 36, 53, 56	Resistor, Carbon, 6.8K, 1/2W, 10%	55-10102JK006R8
R37	Resistor, Carbon, 27K, 1/2W, 10%	55-10102JK027
R38, 52	Resistor, Carbon, 10 ohm, 1/2W, 10%	55-10102JA010
R39	Resistor, Carbon, 100K, 1/2W, 10%	55-10102JK100
R41, 44, 47, 48 57, 59	Resistor, Carbon, 10K, 1/2W, 10%	55-10102JK010
R46	Resistor, Carbon, 270 ohm, 1/2W, 10%	55-10102JA270
R49	Resistor, Carbon, 100 ohm, 1/2W, 10%	55-10102JA100
R50	Resistor, Carbon, 68K, 1/2W, 10%	55-10102JK068
R51, 64	Resistor, Carbon, 4.7K, 1/2W, 10%	55-10102JK004R7
R58	Resistor, Carbon, 33K, 1/2W, 10%	55-10102JK033
R62	Resistor, Carbon, 56K, 1/2W, 10%	55-10102JK056
R65	Resistor, Carbon, 1.5K, 1/2W, 10%	55-10102JK001R5
C1	Capacitor, Electrolytic 200 μ fd@35VDC	56-10216BG207N35
C2	Capacitor, Electrolytic 600 μ fd@10VDC	56-10216BG607N10
C3	Capacitor, Ceramic 47pfd@100VDC	56-10215A470KT10
C4	Capacitor, Mylar 0.22 μ fd@200VDC	56-10206BYB224J2
C5	Capacitor, Mylar 0.01 μ fd@400VDC	56-10205AYA103J4
C6	Capacitor, Mylar 1 μ fd@100VDC	56-10206CYC105J1
C7	Capacitor, Ceramic 0.05 μ fd@600VDC	56-10215H503KT6
Q1-15, 19, 20, 21, 22	Transistor, High Speed Switch, 2N5134	40-09738
Q16, 23, 26, 27 28, 30, 31	Transistor, Signal, 2N2925	40-04233-05
Q17, 18	Transistor, Power, 2N5296	40-09145
Q24, 29	Transistor, Signal, 2N4248	40-09437
Q25	Transistor, Unijunction, 2N2646	40-07794
D1-16, 21, 23, 24, 25, 27, 28, 29	Diode, Signal, 1N4154	40-09297
D17, 18, 19, 20, 22, 26	Diode, Power, 0.8A@100PIV	40-07787-01
Z1	Diode, Zener, 13 volt	40-09219-07
I1, 2	Light, Indicator	52-09334
SW1	Switch, Toggle	43-07643
SW2	Switch, Preset	43-09587
K1	Relay, 2 Form C	45-09730
T1	Transformer, Power	42-09460
F1		
Standard	Fuse, Slow-Blow, Pigtail Leads, 1/4 amp	52-09749-02
'S' Option	Fuse, Slow-Blow, Pigtail Leads, 1/8 amp	52-09749-01
	Front Panel	31-09614
	Enclosure	2EA-30-09619

Table 6





Schematic Diagram
Figure 7

MP MASTER



MA26228

Manufactured by

UNITED SYSTEMS CORPORATION

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